

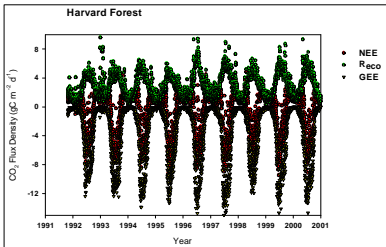
# AmeriFlux and the North American Carbon Program: Terrestrial Impacts and Feedbacks to the Atmosphere

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with contributions from the AmeriFlux network  
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## AmeriFlux Observations



## Long Time Series of Carbon Uptake by a Temperate Forest

- Mid-aged forest increases annual uptake of CO<sub>2</sub> from the atmosphere; significant interannual variability due to weather
- Infrequent weather events (e.g. drought) with lasting consequences are critical for understanding the long-term trajectory of impacts of climate on ecosystems



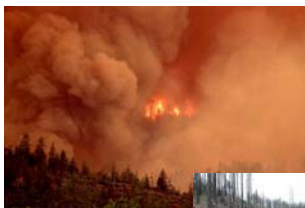
## Forests in Mountains Strongly Impacted by Reduced Snow Pack

- Warmer spring accelerates budbreak
- Early growth exacerbates drought stress in summer. Less annual carbon uptake from the atmosphere, contrary to perception



## Boreal Forest Fires:

- Multidecadal increases in surface albedo after wildfire had a larger impact than fire-emitted greenhouse gases
- Feedback:** Net effect is decreased radiative forcing averaged over 80-year fire cycle (Randerson et al.)



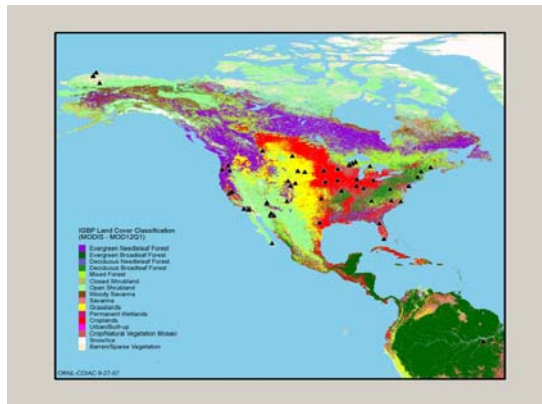
## The AmeriFlux Network

### Goals:

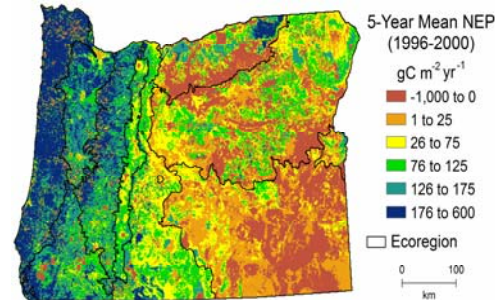
- Quantify land exchange of carbon, water and energy with atmosphere
- Understand carbon absorption and feedbacks

### Features:

- 93 sites – 3 countries
- Key role in North American Carbon Program that aims to quantify and explain the carbon balance of North America



## Integration of AmeriFlux data with remote sensing data, models



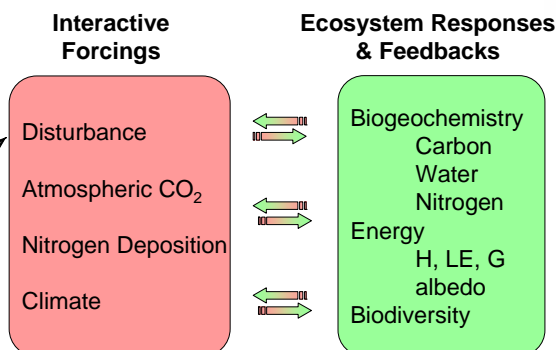
## Carbon Budget of Oregon

- Carbon losses due to forest harvest removals was twice that from wildfire in worst fire year (2002)
- Carbon sequestration was primarily on public forestland, where the harvest rate has fallen dramatically (NW Forest Plan)
- Land-based carbon sink was equivalent to 50% of fossil fuel emissions of Oregon in average year (50% in 2002)
- Potential to store 3x current C stocks in live biomass, primarily in the Coast Range, where forests are among the most productive in the world and can reach 800-1000 years

## Why AmeriFlux?

- The biosphere is currently mitigating the rate of atmospheric CO<sub>2</sub> increase
- Predictions of future climate require an understanding of contemporary changes in ecosystem function
- Need to predict future state of land absorption of carbon
- Policymakers and Resource Managers need this information to better manage carbon and water exchange of ecosystems at local to national levels

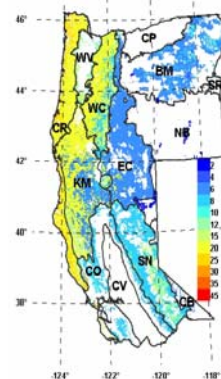
## Anthropogenic Perturbation of Ecosystem Processes: Interactive Effects and Feedbacks



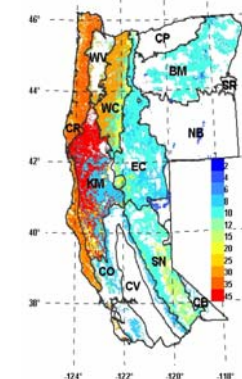
### Interactive effects:

Model simulations and flux data show harvest and wildfire impact forests for decades, and greatly outweigh positive effects of increased atmospheric CO<sub>2</sub> and nitrogen deposition (Magnani et al., Thornton)

## Current Live Biomass



## Potential Live Biomass (kg C m⁻²)



## Acknowledgements

Research supported by DOE grants FG0204ER63911 and FG0207ER64361. Thanks to Bill Munger, Russ Monson, Tara Hudiburg, and AmeriFlux researchers.

## Citations

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<http://public.ornl.gov/ameriflux>